



Module LLE 24mm 2000lm EXC

Modules LLE EXCITE

Product description

- Ideal for linear and panel lights in industrial applications
- Reliable, high lifetime solution and extended temperature range in combination with the INDUSTRY control gears
- Luminous flux range from 2,230 – 6,300 lm
- LED system solution with outstanding system efficacy up to 131 lm/W
- Efficacy of the module up to 154 lm/W
- High colour rendering index CRI > 80
- Small colour tolerance MacAdam 3[®]
- Colour temperatures 3,000, 4,000, 5,000 and 6,500 K
- Perfectly uniform light, even if several LED modules are used together in a line
- Push terminals for simple wiring
- Broad portfolio from extruded lenses and covers available
- Simple installation (e.g. clips or screws)
- Long life-time
- 8-year guarantee



Standards, page 10

Colour temperatures and tolerances, page 13



LLE 24x280mm 2000lm EXC



LLE 24x560mm 4000lm EXC



Specific technical data

Type ^①	Photo-metric code	Typ. luminous flux at tp = 25 °C ^②	Typ. luminous flux at tp = 65 °C ^②	Typ. forward current	Min. forward voltage at tp = 65 °C	Max. forward voltage at tp = 25 °C	Typ. power consumption at tp = 65 °C ^③	Efficacy of the module at tp = 25 °C	Efficacy of the module at tp = 65 °C	Efficacy of the system at tp = 65 °C	Colour rendering index CRI
Operating mode NM											
LLE 24x280mm 2000lm 830 EXC	830/349	2.300 lm	2.150 lm	350 mA	42,0 V	49,5 V	15,6 W	143 lm/W	138 lm/W	124 lm/W	> 80
LLE 24x280mm 2000lm 840 EXC	840/349	2.400 lm	2.280 lm	350 mA	42,0 V	49,5 V	15,6 W	153 lm/W	145 lm/W	131 lm/W	> 80
LLE 24x280mm 2000lm 850 EXC	850/349	2.430 lm	2.300 lm	350 mA	42,0 V	49,5 V	15,6 W	154 lm/W	146 lm/W	131 lm/W	> 80
LLE 24x280mm 2000lm 865 EXC	865/459	2.430 lm	2.300 lm	350 mA	42,0 V	49,5 V	15,6 W	154 lm/W	146 lm/W	131 lm/W	> 80
LLE 24x560mm 4000lm 830 EXC	830/349	4.600 lm	4.300 lm	350 mA	84,0 V	99,0 V	31,2 W	143 lm/W	138 lm/W	124 lm/W	> 80
LLE 24x560mm 4000lm 840 EXC	840/349	4.800 lm	4.560 lm	350 mA	84,0 V	99,0 V	31,2 W	153 lm/W	145 lm/W	131 lm/W	> 80
LLE 24x560mm 4000lm 850 EXC	850/349	4.860 lm	4.600 lm	350 mA	84,0 V	99,0 V	31,2 W	154 lm/W	146 lm/W	131 lm/W	> 80
LLE 24x560mm 4000lm 865 EXC	865/459	4.860 lm	4.600 lm	350 mA	84,0 V	99,0 V	31,2 W	154 lm/W	146 lm/W	131 lm/W	> 80
Operating mode HO											
LLE 24x280mm 2000lm 830 EXC	830/349	3.110 lm	2.900 lm	500 mA	44,5 V	51,8 V	23,5 W	130 lm/W	122 lm/W	110 lm/W	> 80
LLE 24x280mm 2000lm 840 EXC	840/349	3.280 lm	3.060 lm	500 mA	44,5 V	51,8 V	23,5 W	137 lm/W	130 lm/W	117 lm/W	> 80
LLE 24x280mm 2000lm 850 EXC	850/349	3.320 lm	3.100 lm	500 mA	44,5 V	51,8 V	23,5 W	138 lm/W	131 lm/W	118 lm/W	> 80
LLE 24x280mm 2000lm 865 EXC	865/459	3.320 lm	3.100 lm	500 mA	44,5 V	51,8 V	23,5 W	138 lm/W	131 lm/W	118 lm/W	> 80
LLE 24x560mm 4000lm 830 EXC	830/349	6.220 lm	5.800 lm	500 mA	89,0 V	103,6 V	47,0 W	130 lm/W	122 lm/W	110 lm/W	> 80
LLE 24x560mm 4000lm 840 EXC	840/349	6.560 lm	6.120 lm	500 mA	89,0 V	103,6 V	47,0 W	137 lm/W	130 lm/W	117 lm/W	> 80
LLE 24x560mm 4000lm 850 EXC	850/349	6.640 lm	6.200 lm	500 mA	89,0 V	103,6 V	47,0 W	138 lm/W	131 lm/W	118 lm/W	> 80
LLE 24x560mm 4000lm 865 EXC	865/459	6.640 lm	6.200 lm	500 mA	89,0 V	103,6 V	47,0 W	138 lm/W	131 lm/W	118 lm/W	> 80

^① Tolerance range for optical and electrical data: ±10 %.

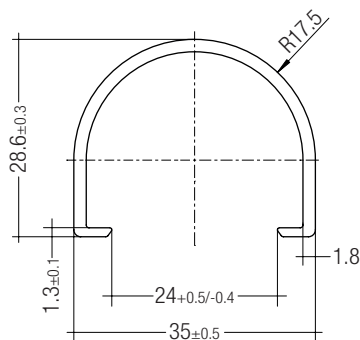
^② If mounted with M4 screws and plastic washers.

^③ Integral measurement over the complete module.

^④ HE ... high efficiency, NM ... nominal mode, HO ... high output.

Product description

- LINEAR COVER for LLE 24
- Protection against direct touch for non-SELV applications
- Fast snap on mounting on to LLE 24 with clips or plastic washers
- High transmission: transparent 94 %, semi-transparent 87 %, diffuse 76 %
- Made of PMMA
- Tolerances: ± 1 mm for 597 mm length (ends finished),
+ 20 mm for 1,200 / 1,500 / 1,600 / 1,800 mm length (ends raw)

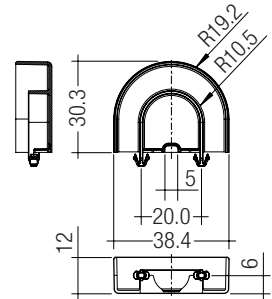
**Ordering data**

Type	Article number	Colour	Length	Packaging carton	Weight per pc.
LINEAR COVER SY Transparent 1600mm	28000338	Transparent	1,600 mm	12 pc(s).	0.272 kg
LINEAR COVER SY Frosted 1800mm	28000437	Semi-transparent	1,800 mm	12 pc(s).	0.308 kg
LINEAR COVER SY Frosted 1600mm	28000339	Semi-transparent	1,600 mm	12 pc(s).	0.272 kg
LINEAR COVER SY Frosted 1500mm	28000435	Semi-transparent	1,500 mm	12 pc(s).	0.244 kg
LINEAR COVER SY Frosted 1200mm	28000422	Semi-transparent	1,200 mm	12 pc(s).	0.205 kg
LINEAR COVER SY Frosted 597mm	28000340	Semi-transparent	597 mm	12 pc(s).	0.102 kg
LINEAR COVER SY Diffuse 1800mm	28000438	Diffuse	1,800 mm	12 pc(s).	0.308 kg
LINEAR COVER SY Diffuse 1600mm	28000341	Diffuse	1,600 mm	12 pc(s).	0.272 kg
LINEAR COVER SY Diffuse 1500mm	28000436	Diffuse	1,500 mm	12 pc(s).	0.257 kg
LINEAR COVER SY Diffuse 1200mm	28000434	Diffuse	1,200 mm	12 pc(s).	0.205 kg
LINEAR COVER SY Diffuse 597mm	28000342	Diffuse	597 mm	12 pc(s).	0.102 kg

ACL ENDCAP LLE24 PUSH-FIX

Product description

- ENDCAP for LLE 24
- Fast snap on mounting (sheet thickness 0.5 – 1.0 mm), for drilling hole 4 mm
- Made of Polycarbonat

**Ordering data**

Type	Article number	Colour	Packaging carton	Weight per pc.
ACL ENDCAP LLE24 PUSH-FIX	28001037	White	480 pc(s).	0.003 kg

ACL LENS 24mm

Product description

- Linear lens for LLE 24
- Available with different beam characteristics
- Protection against direct touch for non-SELV applications
- Fast snap on mounting on to LLE 24 with clips or plastic washers
- Linear lense made of PMMA
- Available lengths: 1,200, 1,500, 1,600 and 1,800 mm,
Tolerance: + 10 mm, at 1,600 mm \pm 20 mm tolerances and
ends raw
- Photometric data available on website



ACL LINEAR LENS 24mm 60°



ACL LINEAR LENS 24mm 90°



ACL LINEAR LENS 24mm INTENSE



ACL LINEAR LENS 24mm BATWING

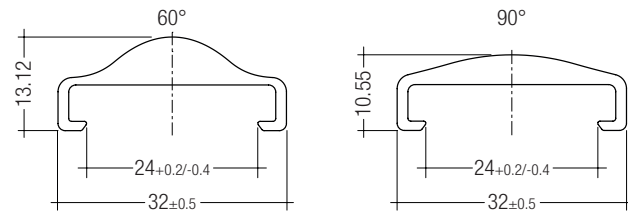


ACL LINEAR LENS 24mm ASY

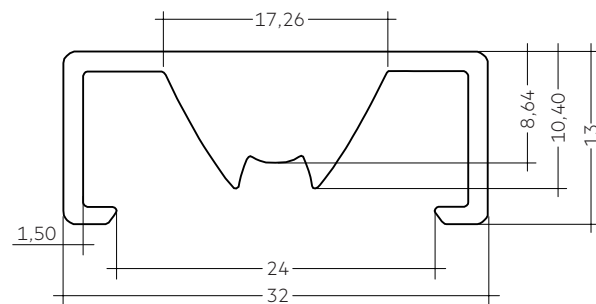


ACL LINEAR LENS 24mm DASy

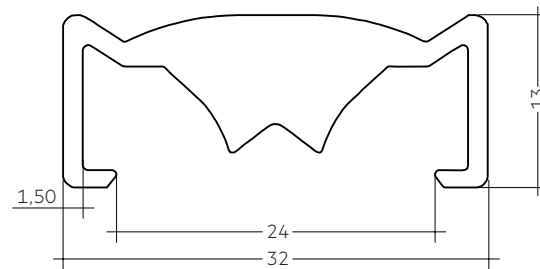
ACL LENS 24mm



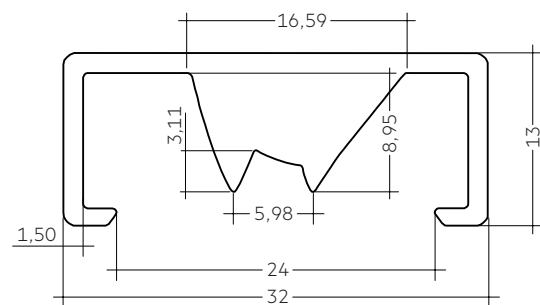
ACL LINEAR LENS 24mm 60° and 90°



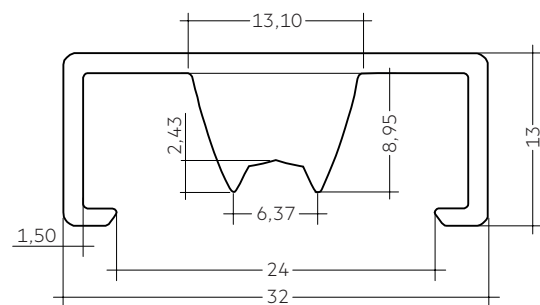
ACL LINEAR LENS 24mm INTENSE



ACL LINEAR LENS 24mm BATWING



ACL LINEAR LENS 24mm ASY



ACL LINEAR LENS 24mm DASY

ACL LENS 24mm

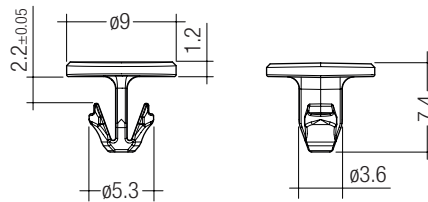
Ordering data

Type	Article number	Beam characteristic	Efficiency	Packaging carton	Weight per pc.
ACL LINEAR LENS 24x1200mm 60°	28001428	60°	97 %	21 pc(s).	0.196 kg
ACL LINEAR LENS 24x1200mm 90°	28001429	90°	97 %	21 pc(s).	0.165 kg
ACL LINEAR LENS 24x1600mm 60°	28000953	60°	97 %	21 pc(s).	0.261 kg
ACL LINEAR LENS 24x1600mm 90°	28000955	90°	97 %	21 pc(s).	0.221 kg
ACL LINEAR LENS 24x1200mm INTENSE	28002024	40°	95 %	18 pc(s).	0.261 kg
ACL LINEAR LENS 24x1500mm INTENSE	28002025	40°	95 %	18 pc(s).	0.326 kg
ACL LINEAR LENS 24x1800mm INTENSE	28002026	40°	95 %	18 pc(s).	0.392 kg
ACL LINEAR LENS 24x1200mm BATWING	28002027	batwing	95 %	18 pc(s).	0.275 kg
ACL LINEAR LENS 24x1500mm BATWING	28002028	batwing	95 %	18 pc(s).	0.344 kg
ACL LINEAR LENS 24x1800mm BATWING	28002029	batwing	95 %	18 pc(s).	0.412 kg
ACL LINEAR LENS 24x1200mm ASY	28002030	asymmetric	95 %	18 pc(s).	0.250 kg
ACL LINEAR LENS 24x1500mm ASY	28002031	asymmetric	95 %	18 pc(s).	0.312 kg
ACL LINEAR LENS 24x1800mm ASY	28002032	asymmetric	95 %	18 pc(s).	0.375 kg
ACL LINEAR LENS 24x1200mm DASY	28002033	double asymmetric	92 %	18 pc(s).	0.249 kg
ACL LINEAR LENS 24x1500mm DASY	28002034	double asymmetric	92 %	18 pc(s).	0.311 kg
ACL LINEAR LENS 24x1800mm DASY	28002035	double asymmetric	92 %	18 pc(s).	0.373 kg

CLIP 4.3mm

Product description

- Clip for fixation of LED modules with 4.3 mm holes
- Fast snap on mounting (sheet thickness 0.5 – 1.0 mm)
- For drilling hole 4 mm
- Clip made of Polycarbonat



Ordering data

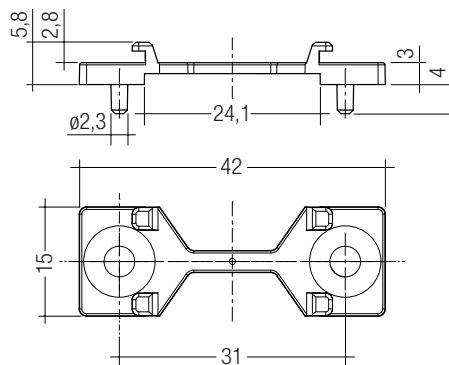
Type	Article number	Colour	Packaging bag [®]	Weight per pc.
ACL CLIP 4.3mm PUSH-FIX	28001036	White	500 pc(s).	0.001 kg

[®] Minimum sales quantity 500 pcs.

BRIDGE LLE24/40

Product description

- Enables the fixation of 24 mm wide Tridonic LED modules to fixtures made for 40 mm wide modules
- Ideal for extruded aluminium gear trays made for 40 mm modules with pre-alignment knobs
- Clip-on for LINEAR COVER and LINEAR LENS[®]
- For LLE 24 with 280 mm module minimum 2 bridges required
- For LLE 24 with 560 mm module minimum 3 bridges required
- Fixation via M3 or M4 countersunk screw, max. tightening torque 0.5 Nm
- BRIDGE made of white polycarbonate



Ordering data

Type	Article number	Colour	Packaging carton [®]	Weight per pc.
ACL BRIDGE LLE24/40 SCREW-FIX	28001205	White	600 Stk.	0.001 kg

[®] Minimum sales quantity 600 pcs.

[®] Beam characteristics will change due to the elevated fixation (see photometric files for details).

1. Standards

IEC 62031
IEC 62471
IEC 62778
IEC 61000-4-2

1.1 Photometric code

Key for photometric code, e. g. 830 / 349

1 st digit	2 nd + 3 rd digit	4 th digit	5 th digit	6 th digit		
Code	Colour temperature in Kelvin x 100	McAdam initial	McAdam after 25% of the life-time (max.6000h)	Luminous flux after 25% of the life-time (max.6000h)		
7				70 – 79	Code	Luminous flux
8				80 – 89	7	≥ 70 %
9				≥90	8	≥ 80 %
				9	≥ 90 %	

1.2 Energy classification

Type	Forward current	Energy classification
LLE 24mm EXC	350 mA	A++
	500 mA	A+

2. Thermal details

2.1 tc point, ambient temperature and life-time

The temperature at tp reference point is crucial for the light output and life-time of a LED product.

For LLE a tp temperature of 65 °C has to be complied in order to achieve an optimum between heat sink requirements, light output and life-time.

Compliance with the maximum permissible reference temperature at the tc point must be checked under operating conditions in a thermally stable state. The maximum value must be determined under worst-case conditions for the relevant application.

The tc and tp temperature of LED modules from Tridonic are measured at the same reference point.

Temperatures of up to approx. 200 °C can occur locally on the LED module. Safe operation must be ensured by appropriate selection of materials and luminaire construction.

2.2 Storage and humidity

Storage temperature	-30... +80 °C
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Operation only in non condensing environment.

Humidity during processing of the module should be between 0 to 70 %.

2.3 Thermal design and heat sink

The rated life of LED products depends to a large extent on the temperature. If the permissible temperature limits are exceeded, the life of the LLE will be greatly reduced or the LLE may be destroyed.

2.4 Heat sink values

LLE 24x280mm 2000lm

ta	tp	Forward current	Rth, hs-a	Cooling area
25 °C	85 °C	350 mA	3.71 K/W	112 cm ²
25 °C	85 °C	500 mA	5.93 K/W	180 cm ²
35 °C	85 °C	350 mA	3.09 K/W	135 cm ²
35 °C	85 °C	500 mA	4.95 K/W	216 cm ²
45 °C	85 °C	350 mA	2.46 K/W	169 cm ²
45 °C	85 °C	500 mA	3.95 K/W	271 cm ²
55 °C	85 °C	350 mA	1.88 K/W	227 cm ²
55 °C	85 °C	500 mA	2.93 K/W	356 cm ²
65 °C	85 °C	350 mA	1.25 K/W	346 cm ²
65 °C	85 °C	500 mA	2.93 K/W	535 cm ²
75 °C	85 °C	350 mA	0.62 K/W	718 cm ²
75 °C	85 °C	500 mA	1.93 K/W	1,077 cm ²

LLE 24x280mm 2000lm

ta	tp	Forward current	Rth, hs-a	Cooling area
25 °C	85 °C	350 mA	1.85 K/W	224 cm ²
25 °C	85 °C	500 mA	2.96 K/W	360 cm ²
35 °C	85 °C	350 mA	1.54 K/W	270 cm ²
35 °C	85 °C	500 mA	2.47 K/W	432 cm ²
45 °C	85 °C	350 mA	1.23 K/W	338 cm ²
45 °C	85 °C	500 mA	1.97 K/W	542 cm ²
55 °C	85 °C	350 mA	0.94 K/W	554 cm ²
55 °C	85 °C	500 mA	1.46 K/W	712 cm ²
65 °C	85 °C	350 mA	0.62 K/W	692 cm ²
65 °C	85 °C	500 mA	1.46 K/W	1,070 cm ²
75 °C	85 °C	350 mA	0.31 K/W	1,436 cm ²
75 °C	85 °C	500 mA	0.96 K/W	2,154 cm ²

Notes

The actual cooling surface can differ because of the material, the structural shape, outside influences and the installation situation. Depending on the heat sink a heat conducting paste or heat conducting film might be necessary to keep the specified tp temperature.

3. Installation / wiring

3.1 Electrical supply/choice of LED Driver

LLE modules from Tridonic are not protected against overvoltages, overcurrents, overloads or short-circuit currents. Safe and reliable operation can only be guaranteed in conjunction with a LED Driver which complies with the relevant standards. The use of LED Driver from Tridonic in combination with LLE modules guarantees the necessary protection for safe and reliable operation.

If a LED Driver other than Tridonic is used, it must provide the following protection:

- Short-circuit protection
- Overload protection
- Overtemperature protection



LLE module must be supplied by a constant current LED Driver. Operation with a constant voltage LED Driver will lead to an irreversible damage of the module.

Wrong polarity can damage the LLE.

If LLE 24x280mm modules are wired in parallel and a wire breaks or a complete module fails then the current passing through the other module increases and the thermal load too. This may reduce its life considerably. In addition there can be slight differences in light output caused by tolerances.

The LLE 24x560mm module is designed for serial wiring. Parallel wiring is not permitted.

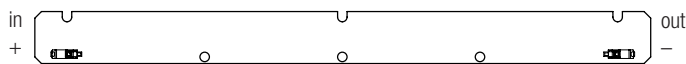
LLE modules can be operated either from SELV LED Drivers or from LED Drivers with LV output voltage.



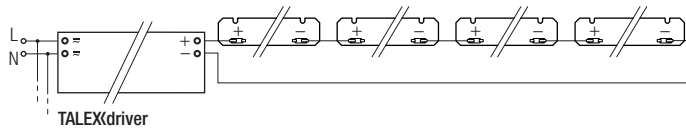
LLE are basic isolated up to 300 V (if mounted with M4 screws in combination with plastic washers) against ground and can be mounted directly on earthed metal parts of the luminaire. If the max. output voltage of the LED Driver (also against earth) is above 300 V, an additional isolation between LED module and heat sink is required (for example by isolated thermal pads) or by a suitable luminaire construction.

At voltages > 60 V an additional protection against direct touch (test finger) to the light emitting side of the module has to be guaranteed. This is typically achieved by means of a non removable light distributor over the module.

3.2 Wiring

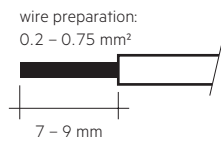


Wiring examples



3.3 Wiring type and cross section

The wiring can be solid cable with a cross section of 0.2 to 0.75 mm². For the push-wire connection you have to strip the insulation (7–9 mm).



Inserting stranded wires / removing wires by lightly pressing on the push button.

3.4 Mounting instruction



None of the components of the LLE (substrate, LED, electronic components etc.) may be exposed to tensile or compressive stresses.

Max. torque for fixing: 0.5 Nm.

The LED modules are mounted onto a heat sink with min. 4 screws per module. In order not to damage the modules only rounded head screws and an additional plastic flat washer should be used.

LED modules must lie flat on the mounting surface.



Chemical substance may harm the LED module. Chemical reactions could lead to colour shift, reduced luminous flux or a total failure of the module caused by corrosion of electrical connections.

Materials which are used in LED applications (e.g. sealings, adhesives) must not produce dissolver gas. They must not be condensation curing based, acetate curing based or contain sulfur, chlorine or phthalate.

Avoid corrosive atmosphere during usage and storage.

3.5 EOS/ESD safety guidelines



The device / module contains components that are sensitive to electrostatic discharge and may only be installed in the factory and on site if appropriate EOS/ESD protection measures have been taken. No special measures need be taken for devices/modules with enclosed casings (contact with the pc board not possible), just normal installation practice. Please note the requirements set out in the document EOS / ESD guidelines (Guideline_EOS_ESD.pdf) at: <http://www.tridonic.com/esd-protection>

4. Life-time

4.1 Life-time, lumen maintenance and failure rate

The light output of an LED Module decreases over the life-time, this is characterized with the L value.

L70 means that the LED module will give 70 % of its initial luminous flux. This value is always related to the number of operation hours and therefore defines the life-time of an LED module.

As the L value is a statistical value and the lumen maintenance may vary over the delivered LED modules.

The B value defines the amount of modules which are below the specific L value, e.g. L70B10 means 10 % of the LED modules are below 70 % of the initial luminous flux, respectively 90 % will be above 70 % of the initial value. In addition the percentage of failed modules (fatal failure) is characterized by the C value.

The F value is the combination of the B and C value. That means for F degradation and complete failures are considered, e.g. L70F10 means 10 % of the LED modules may fail or be below 70 % of the initial luminous flux.

4.2 Lumen maintenance for LLE 24mm EXC

Forward current	tp temperature	L90 / F10	L90 / F50	L80 / F10	L80 / F50	L70 / F10	L70 / F50
350 mA	65 °C	64,500 h	65,500 h	>100,000 h	>100,000 h	>100,000 h	>100,000 h
350 mA	85 °C	61,000 h	62,000 h	>100,000 h	>100,000 h	>100,000 h	>100,000 h
500 mA	65 °C	52,500 h	53,500 h	>100,000 h	>100,000 h	>100,000 h	>100,000 h
500 mA	85 °C	46,000 h	47,000 h	>100,000 h	>100,000 h	>100,000 h	>100,000 h

4.3 Switching capability

50,000 cycles

Tested according to IEC 62717 Cl 10.3.3

30 s on / 30 s off at I_{max}

5. Electrical values

5.1 Declaration of electrical parameters

I_{rated} ... Nominal operating current the module is designed for.

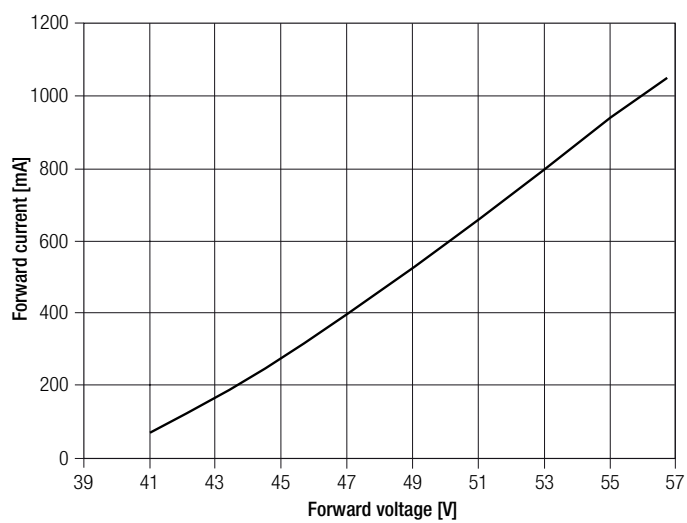
I_{max} ... Max. permissible continuous operating current incl. The tolerances of the LED driver.

Max. permissible LF current ripple ... Max. output current of the LED driver incl. Tolerances and LF current ripple must not exceed this value.

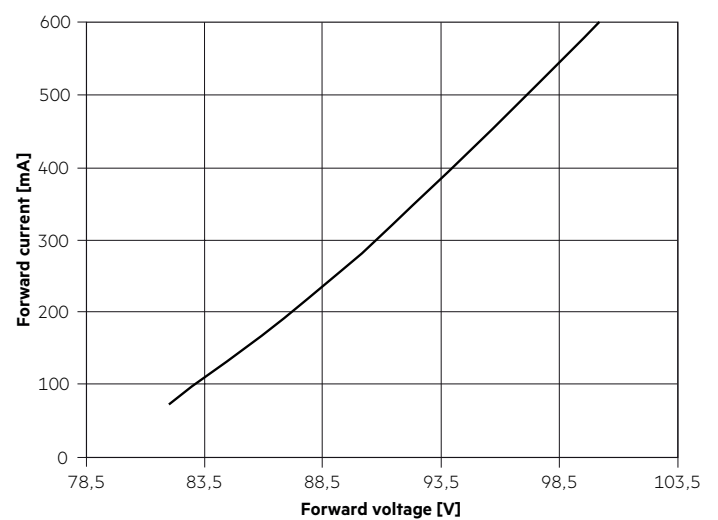
Max. permissible peak current ... The max. output peak current of the LED driver must not exceed this value.

5.2 Typ. forward voltage vs. forward current

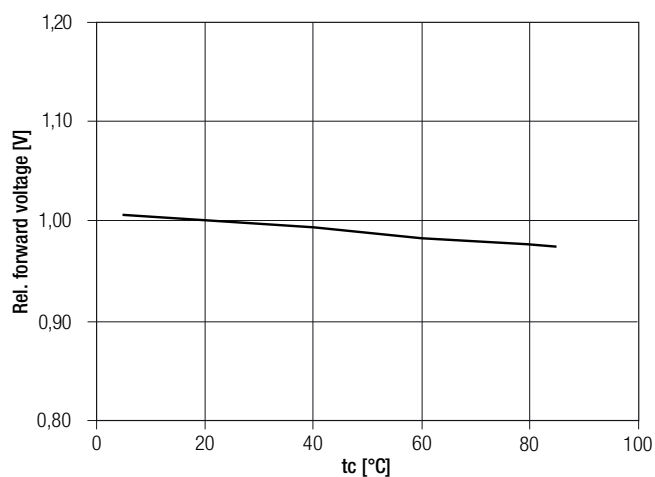
LLE 24x280mm 2000lm 8xx EXC



LLE 24x560mm 4000lm 8xx EXC



5.3 Forward voltage vs. t_c temperature



The diagrams are based on statistic values.

The real values can be different.

6. Photometric characteristics

6.1 Coordinates and tolerances according to CIE 1931

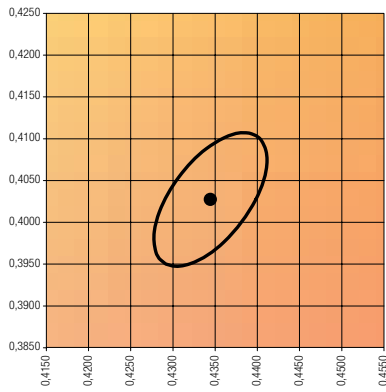
The specified colour coordinates are integral measured by a current impulse with typical values of module and a duration of 100 ms.

The ambient temperature of the measurement is $t_a = 25^\circ\text{C}$.

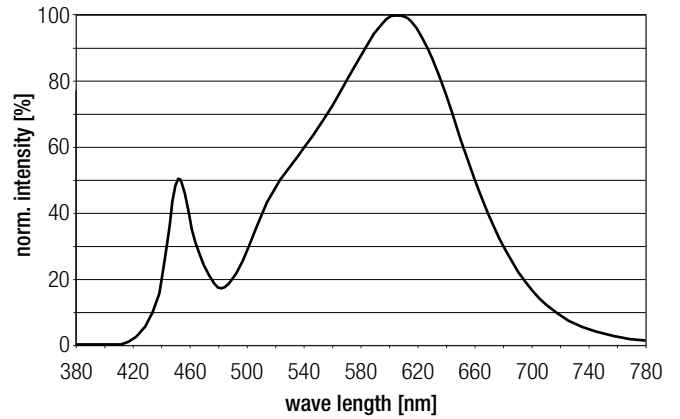
The measurement tolerance of the colour coordinates are ± 0.01 .

3,000 K

	x0	y0
Centre	0.4342	0.4028

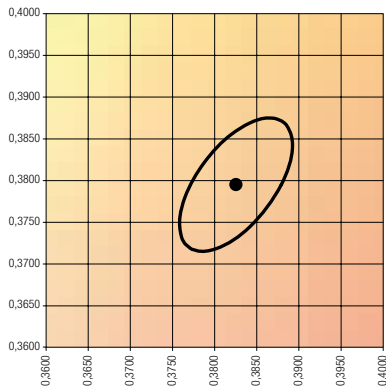


MacAdam Ellipse: 3SDCM

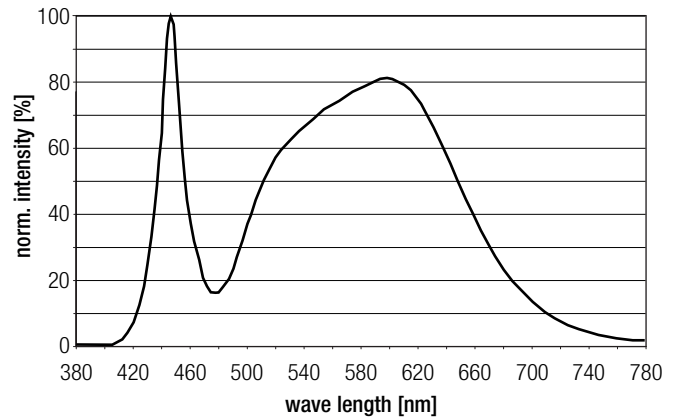


4,000 K

	x0	y0
Centre	0.3825	0.3798

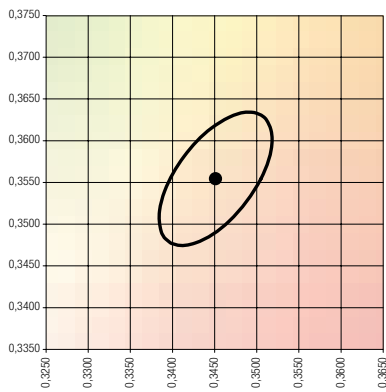


MacAdam Ellipse: 3SDCM

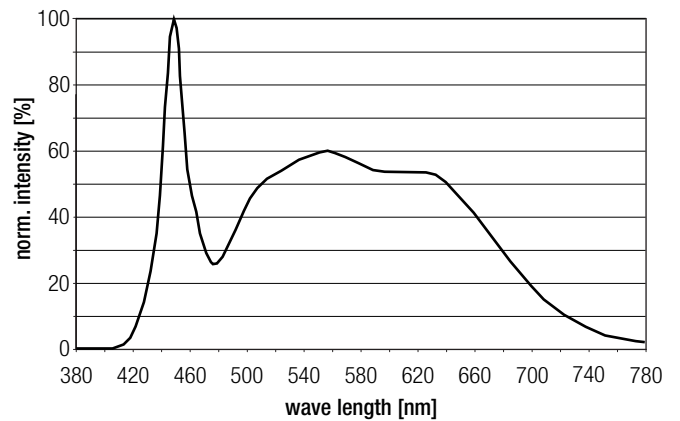


5,000 K

	x0	y0
Centre	0.3451	0.3554

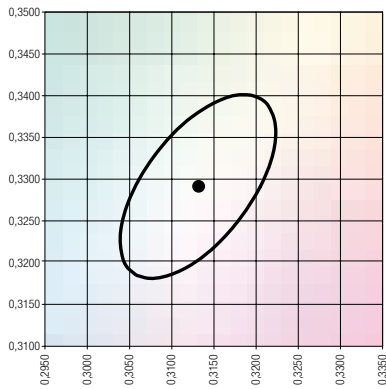


MacAdam Ellipse: 3SDCM

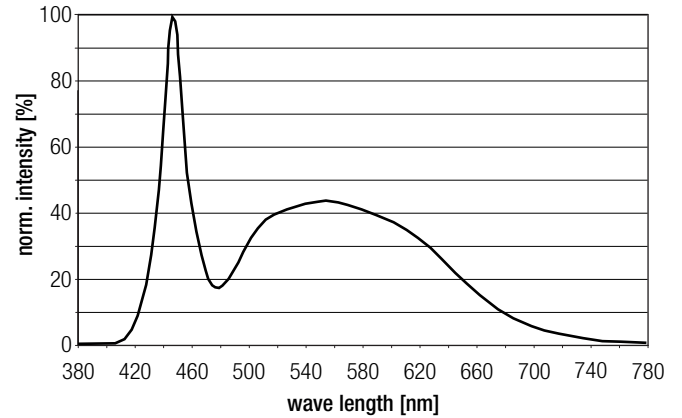


6,500 K

	x0	y0
Centre	0.3130	0.3290

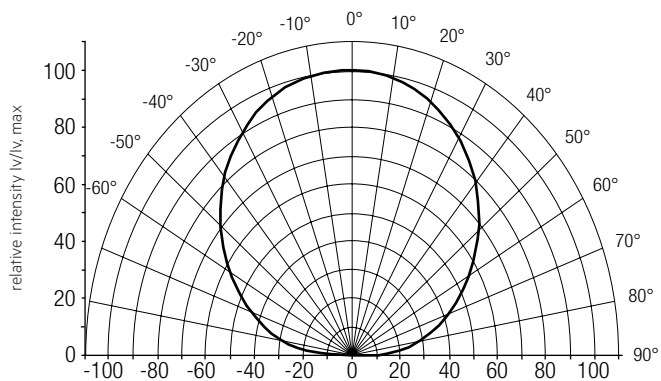


MacAdam Ellipse: 3SDCM



6.2 Light distribution

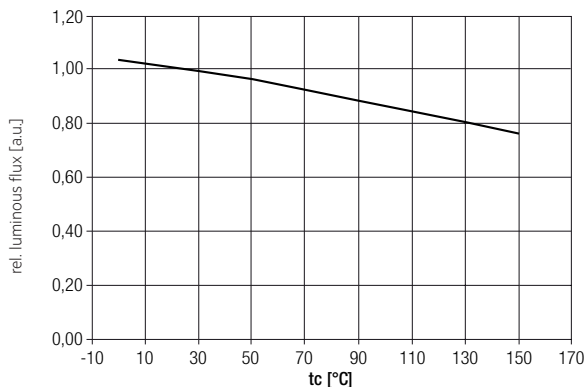
The optical design of the LLE product line ensures optimum homogeneity for the light distribution.



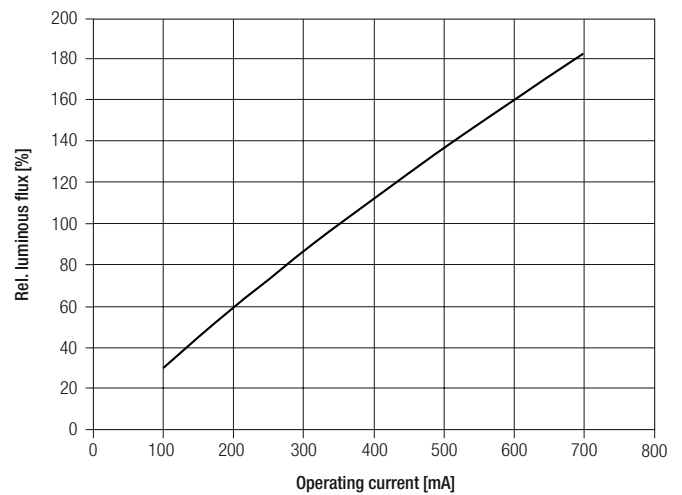
The colour temperature is measured integral over the complete module. The single LED light points can have deviations in the colour coordinates within MacAdam 7.

To ensure an ideal mixture of colours and a homogenous light distribution a suitable optic (e. g. PMMA diffuser) and a sufficient spacing between module and optic (typ. 4 cm) should be used.

6.3 Relative luminous flux vs. tc temperature



6.4 Relative luminous flux vs. operating current



The diagrams are based on statistic values. The real values can be different.

7. Miscellaneous

7.1 Additional information

Additional technical information at www.tridonic.com → Technical Data

Guarantee conditions at www.tridonic.com → Services

Life-time declarations are informative and represent no warranty claim.